Development of a Virtual Reality Platform as a Training Tool Using Gaming Software

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***Abstract*—Virtual Reality (VR) is a well-known technology that is applied in many areas including education, medical, manufacturing etc. In the engineering field, VR is commonly used as a toolkit to train humans to perform complex tasks such as aircraft piloting, chemical handling etc. However, the practicality of using gaming software as a VR platform for training purposes needs to be investigated. In this paper, the DarkBASIC Professional (DBPro) gaming software was applied as a VR platform to train humans' adaptability towards new environments. The design of the structure of the VR platform using DBPro is described together with the main elements including 3D modeling, mapping, lighting and sound effects, and player's control. A comparison between the real world and the VR platform was evaluated. Ten selected subjects conveyed positive feedback on the realism of the VR platform through the survey. The results show that the time taken to complete a task was reduced up to 60% after the subjects performed the VR training in advance. It is hoped that the VR platform will support VR training with low development costs and an open source concept.**

***Index Terms*—Gaming Software; Tools; Virtual Reality; 3D Modelling.**

I. INTRODUCTION

Virtual Reality (VR) is defined as an alternate world filled with computer-generated images that respond to human movements [1]. The definition of VR makes reference to a particular technology that applied to the system. For instance, a VR system can include real-time animation, wired gloves and position trackers for control, head-mounted stereoscopic displays etc.

VR can be classified into three major systems; non-immersive, semi-immersive and fully immersive [2]. Non-immersive is the least developed form of VR system and only involves the use of a computer desktop with a keyboard, mouse or joystick. In some cases, a high-resolution monitor is used to improve the immersion. Semi-immersive includes high-performance graphic computing systems together with a large projector screen or multiple monitor projection systems. Fully immersive is the most advanced and is closer to the actual experience of virtual environment (VE). It may include wearing a head-mounted display (HMD) with several tracking and haptic feedback systems. In this project, a semi-immersive VR system was implemented where the VR environment was projected onto a large screen in order to increase the immersion.

VR technology has been applied as training tools in many areas including emergency drills, medical training, education etc. An emergency evacuation drill was developed by [3] to determine human behavior and evacuation time during an emergency situation. Participants were tested in the virtual environment (VE) with three different scenarios and the goal was to find the exit of the building. The researcher found that using the 'Second Life' game engine to simulate the virtual environment of a building for training purposes was credible and had high potential value for subsequent research. [4] also made use of VR to teach fire-safety skills to children. Students learned home fire hazards with a companion and then practiced exiting from a simulated fire in the virtual environment.

In medical training, [5] explored some examples of commercial simulators and concluded that there was a need to evaluate the speed and accuracy of the systems. Besides, certain aspects of gaming and playing should be examined with regards to learning. For example, goal-driven activities can be developed using VR since the progress towards the goal can be evaluated. At the same time, [6] also selected several game engines to simulate a virtual environment for surgery practices. The results showed that the game-based engine was suitable for applying simple simulations based on pre-recorded animations.

On the other hand, [7] used a VR tool to teach students to have better learning in scaffolding poetry lessons. Several learning modules were designed in VR form to facilitate the learning process. The researcher found that students were highly engaged with the VR learning environment compared to the conventional teaching method. [8] also organized an engineering drawing course in VR so as to improve the visualization and imagination skills of the student. This facilitated the student to add in or remove object in a three-dimensional way effortlessly in an unlimited space and safe environment [9], [10]. Therefore, it is significant to understand the effective instructional designs for a better integration of VR [11]. [12] had proved that about 90% to 95% teacher and student prefer a VR interactive environment in the school learning process.

The development of VR platform using gaming software is considered limited. Since the development program is considered low costs [14] and all related coding is open source, there is a need to explore the potential of gaming software as a VR platform. Gaming software known as DarkBASIC Professional (DBPro) is applied in this research. DBPro is based on the BASIC computing language that has been enhanced specifically to aid the creation of games programs [13]. The development programs can be redistributed or modified based on the specific project and it is publicly accessible. The objective of this research is to develop a VR platform using gaming software and to evaluate